May Day

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PROJECT # 19
RURAL MAYDAY1800 CALL-IN SYSTEM FEASIBILITY

SUMMARY OF MAYDAY INITIATIVES

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NOTICE

EXECUTIVE SUMMARY

This document contains task 2 of the stated scope for the I-95 Corridor Coalition - Project No. 19, Rural Mayday/800 Call-in System Feasibility, which is a review of existing and planned Mayday programs. The report summarizes eight operational Tests and seven Private Mayday Programs and technologies.

Each summary begins with highlights of information relative to each operational test and technology. These consist of location, scope, cost, type of technology, status, time frame, and contact names associated with each operational test/technology. Included in individual summaries are semi-technical descriptions of the operational test and the technologies associated with these tests. The cost for the Public Operational Tests indicates the total cost allocated towards the project, whereas the cost for the Private Mayday initiatives indicates the cost to the user. The Private Mayday technologies are potentially powerful tools in a Mayday system. The information in this document was compiled from information obtained by contacting relevant individuals directly involved with each operational test and product. This document is an all-inclusive list of the most complete information available to date and the Center for Transportation Research recognizes that this is a living document and information may be added or modified over time. Later deliverables will include analyses of enabling technologies related to possible Mayday implementations and a comparative assessment of the summarized tests.

SUMMARY OF MAYDAY INITIATIVES

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INTRODUCTION

Today an innovative series of public-private partnerships in the United States is working toward an infrastructure for an emergency vehicle location system that when activated by the motorist or due to crash, will transmit a request for help along with the vehicle's location to emergency service personnel. The federal and state governments and private organizations are coordinating different projects across the country with the aim to spur the implementation of a nationwide emergency vehicle location system. Different Mayday projects are being funded and implemented through the joint efforts of various public and private sector interests. The Multistate Mayday group has been formed to communicate among the different Mayday activities that are going on in different states. This was founded by the ENTERPRISE group including DOTs from Arizona, Colorado, Iowa, Michigan, Minnesota, North Carolina, and Washington State. In addition to the ENTERPRISE members, the Multistate Mayday group also includes the New York DOT, Calspan, the Virginia DOT, and Virginia Tech. Realizing the importance of developing a Mayday system, the I-95 corridor coalition has contracted the Center for Transportation Research (CTR) and the Mobile and Portable Radio Group (MPRG) at Virginia Tech for the Rural Mayday/800 Call-in System Feasibility, Project #19. The objective is to be able to define a Mayday strategy within the Northeast Corridor. Evaluation of factors such as cost effectiveness, optimal integration of different technologies, compatiblity with the environment, usefulness to a broad population base and maximum coverage pave the path leading towards this objective.

Mayday programs in ITS are approaching a rapidly changing communications and marketing landscape. As innovative products integrating position location and communication systems are evolving, user needs are also changing. Travelers are demanding more than just roadside call boxes or position information to suit their needs. They are also equally concerned with safety and security issues. Institutional and networking issues concerning call routing need to be addressed. The public safety answering points (PSAPs) should have the capability to handle all the data that they receive. The jurisdictional boundaries and agreements among the PSAPs should also be well defined to quickly and correctly respond to or transfer a call. This might require the development of special purpose software to do the networking. This might also require increasing the efficiency of the PSAPs through technology.

As part of the study, the CTR is surveying existing Mayday operational tests and deployments to determine which systems and technologies offer the strongest advantages in terms of cost, infrastructure requirements, compatibility with national trends, and performance in both rural and urban environments. We intend to study the call processing within the existing PSAPs across the corridor and identify efficient protocols to make use of the new Mayday information. In addition, we are analyzing feasible technologies suitable for a wireless Mayday system which can evolve into onboard technologies capable of accurate position location. Some examples include spread spectrum, PCS, CDPD, GPS, FM, LEOSAT, and cellular technologies. In order to determine the viability of cellular and GPS position location (two of the top candidates), we are performing coverage measurement across different terrain along the I-95 corridor. Our research will compile detailed summaries of the current state of Mayday systems and will provide in-depth comparisons based on many factors of alternative Mayday technologies. We are also planning a regional Mayday meeting to be held on November 8th in Nothern Virginia which will broaden the perspective of Mayday activities.

MAYDAY OPERATIONAL TESTS

Participants	Sensors	In-Vehicle /Highway	Scope	Project cost	Time Frame	Comments
I-95 Corridor Coalition Mayday Project #19 (Virginia Tech)	TBD	TBD	One or more test sites in the I-95 Corridor	Approx. $300,000	Start Date: April 1996 End Date: April 1997	Project intends to analyze existing and planned Mayday projects and define operational test possibilities.
Smart Call Box (San Diego, CA)	Cellular telephone network coupled with a micro processor; Two-way voice communications possible.	HW	10,000 call boxes at l/4 to 1 mile intervals.	$2.260.200	Start Date: Sept 1993 End Date: March 1996	Siteinvestiaattonaandinventory of existing management devices that could interface with the Smart Call Boxes in progress.
Colorado MAYDAY System	TIDGET devices use GPS; Cellular phones for two-way communication	In-Vehicle	50 vehicles currently being equipped and 2050 vehicles authorized by the FHWA to be equipped	$3.832.285	Start Date: Oct. 1994 End Date: Dec. 1997	Based significantly on strength of cellular signal; 87% of location reports within 100 meters of true position; Object is to use low cost components.
Puget Sound Help Me (PuSHME) (Washington state)	One system based on CDPD that utilizes GPS with two way pagers, and the other is analog that uses Motorola voice/data equipment	In-Vehicle	250 units installed	$2,500,000	Start Date: Nov. 1994 End Date: Completed May. 1996	Evaluate performance of both the systems; Examine issues of dropped canter, topographical interference, location accuracy
Minnesota MAYDAY Plus	GPS, Crash sensors, cellular communication	In-Vehicle	Initial operating area of 80 miles radius	$2,519,130	Start Date: Jan. 1991 End Date : Under negotiation	Added emphasis on fully **automated collision notification**
CAPITAL IVHS Beltway Project (Washington DC)	Cellular geolocation using sensor equipped Bell Atlantic towers	In-Vehicle	Complete end-to-end test from collection and processing of data to the dissemination of traffic data to remote users	$7,229,418	Start Date: Aug. 1993 End Date: Dec. 1995	Extensive use of existing cellular infrastructure for areawide surveillance and communications using ERA equipment
CALSPAN Automatic Collision Notification System (Erie County. New York) --	GPS. crash sensors, cellular communications. and automated mao display technilogies	In-Vehicle	Proposed to equip ACN system on 1000 privately owned cars, and covering western portion of New York state'	$3.933,658	Start Date: Sept 1995 End Date: March 1998	Added emphasis on fully-automated collision notification
Transcal Emergency Notification System (ENS)	GPS technology integrated with satellite communications network	In-vehicle	Determine the utility and technical feasibility of a satellite-based emergencylocation system for distressed vehicles in mountainous regions	$7,155.000	Start Date: Late 1996	Claims 100% geographic coverage. Due to slow emergence of LEO services, limited testing scheduled in late 1997
Northrop Grumman IDEA project	GPS technology, combination of cellular network and groundwave transmitter, and portable RDF unit	In-Vehicle	System in development for DOT	$99,514 & $20,000 cost sharing	Under negotiation	Able to function without GPS or cellular

PRIVATE MAYDAY TECHNOLOGIES

Participants	Sensors	In-Vehicle /Highway	Scope	User Cost	Time Frame	Comments
Ford Rescu (Remote Emergency Satellite Cellular Unit) System (Nationwide)	GPS technology integrated with cellular network (Motorola's cellular phone)	In-Vehide	Nationwide service provided for equipped Lincolns	$1,995, No monthly fee for 4 year agreement	Installed in 1996 Lincoln Continental	Answering point in Westinghouse Emergency Response center in Irving, TX
GM/Cadillac Onstar System (Nationwide)	GPS technology integrated with cellular network	In-Vehicle	Nationwideservice provided for equipped Cadillacs	$895and service fee of $22.50 per month	Will debut later this year on 1997 Cadillac	Automatic notification of airbagdeployment, theft detection. remote door unlock, routing, roadside assistance
OmniTRACS by QUALCOMM	Satellite system	In-Vehicle	Capable of providing national coverage	$80-$120/month for 2-3 messages/ day	In initial stages of being marketed	Vehicle location is provided hourly and in each message as part of the base service
Comtrak's Quiktrak	Tracking and two-way communications using a network of radio transmitters and receivers, TDOA	In-Vehicle	Stolen vehicle recovery, personal safety, emergency roadsideassistance, vehicle location and managementsystem	Not Available	Operational in Mexico City and Sydney	Need of radio transmitters and receivers throughout the coverage region
Rockwell/ADT Emergency Response Network	GPS technology	In-Vehicle	Nationalcoverage	Not Available	Under negotiation	Communication through fast and cheaper data network
Tendler Cellular Fonefinder	GPS-based chip to be installed into cellular phones	In-Vehicle	Nationalcoverage	Not Available	Under negotiation	No infrastructure cost, no changes to cellular phone switches, no cost to the recipient of the massage
Trueposition Enhanced Cellular Services	Cellular technology	In-Vehicle	Nationalcoverage	Not Available	Under negotiation	Will be used in New Jersey Operational Test

Mayday Operational Tests Features

	Status			Partnerships			Supporting Technologies								
							Location Finding					Communications			
	Under Negotiation	In Progress	Completed	Public	Private	Both	GPS	DGPS	TDOA	T O A	AOA	RF	Satellite	Digital Cellular	Analog Cellular
Capspan ACN System		•				•	•							•	
Colorado Mayday System		•				•	•							•	•
CAPITAL Beltway Project			•			•			•	•	•				•
Minnesota Mayday Plus	•			•			o							o	
Northrop Grumman IDEA project	•					•	o							o	
Puget Sound Help Me (PUSHME)			•	•			•	•						•	•
San Diego Smart Call Box			•			•									•
Transcal Emergency Notification System (ENS)	•			•			o						o		

Private Mayday Technologies Features

	Status			Partnerships			Supporting Technologies								
							Location Finding					Communications			
	Under Negotiation	In Progress	Completed	Public	Private	Both	GPS	DGPS	TOA	TDOA	AOA	RF	Satellite	Digital Cellular	Analog Cellular
Ford RESCU System			•		•		•								•
GM Onstar			•		•		•								•
OmniTRACS by QUALCOMM			•		•		•						•		
Comtrak's Quiktrak			•		•					•		•			
Rockwell/ADT Emergency Response Network		•					•								
Tendler Cellular Fonefinder		•			•		•								•
Trueposition Enhanced Cellular Services	•				•					•					•

o Proposed

OPERATIONAL TESTS

Calspan Automated Collision Notification (ACN) System

(CAPITAL) Beltway Project

Colorado Mayday System

Minnesota Mayday Plus

Northrop Grumman IDEA Project

Puget Sound Help Me (PUSHME) Mayday System

San Diego Smart Call Box

Transcal Emergency Notification System (ENS)

CALSPAN AUTOMATED COLLISION NOTIFICATION (ACN) SYSTEM

Highlights

- 0 Location:
  Erie County, New York
- 0 Scope:
  Evaluate the efficiency of the ACN system and provide data to evaluate the potential of the ACN system for national implementation specifically in the areas of system cost, consumer acceptance, and ability to integrate the ACN system with other ITS user services.
- 0 Cost:
  $3,933,658 (estimated total project cost)
- 0 Technology:
  Crash sensors, cellular communications equipment, GPS, in-vehicle signal processor
- 0 Status:
  System development to be completed by late 1996, operational test March, 1997
- 0 Contact:

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Basic Description of Project

Calspan's ITS program will provide a focused demonstration of the critical Automated Collision Notification (ACN) system functions, enabling a careful evaluation of the utility and benefits of the system. This operational test will integrate existing crash sensors, cellular communication equipment, Global Positioning Satellite (GPS) position location devices and automated map display technologies into an ACN system that is designed to reduce Emergency Medical Services (EMS) response times for victims of motor vehicle accidents.

Goals and Objectives

0 Demonstrate the improvements in the efficiency of emergency services offered by systems with ACN, with primary emphasis on reducing the time for delivery of medical care to victims of motor vehicle accidents
0 Evaluate the effectiveness of interfaces between the ACN system and the local traffic-control/incident management agencies
0 Demonstrate the ability to implement the ACN system in local, multi-jurisdictional infrastructure by providing data to evaluate the acceptance of ACN by local agencies

Description of Technology

The Calspan ACN system incorporates an in-vehicle signal processor which continuously monitors the 3-axis accelerometer outputs and detects the occurrence of an accident. Using an algorithm based on the vehicle acceleration history, the signal processor then computes a measure of the severity of the accident. It assembles a message containing information on the crash severity (angle of impact, rollover, etc.); vehicle location and heading at the time of accident (obtained from the GPS); and the vehicle cellular phone number. The signal processor uses the vehicle cellular phone to automatically dial a preprogrammed I-800 number that calls the 911 message receipt center. The processor then transmits a digital data message with the accident information and receives confirmation of receipt of the message.

The central dispatcher receives visual and audio alarms indicating receipt of the accident information. The message is displayed on a computer screen, along with a map identifying the location of the vehicle. Special-purpose software is used to identify the appropriate PSAP (Public Safety Answering Point) and the responsible fire/rescue/Emergency Medical Service (EMS)/police agencies to which the call should be referred. The central dispatcher attempts to make voice contact with the occupant(s) of the vehicle using the cellular phone that transmitted the accident message. Later on, the central dispatcher also notifies regional traffic management centers which determine requirements for traffic re-routing, traffic control, specialized emergency management equipment, and incident response strategies.

The PSAP receives and displays the data from the central dispatcher, attempts to establish contact with the vehicle occupants, and uses the available information on the location and nature of the incident to confirm appropriate fire/rescue/Emergency Medical Service (EMS)/police responders. If the accident appears severe and has occurred in an area requiring long transport time to the hospital, the dispatcher may alert the helicopter transport service. The PSAP transmits an alert to the responding agencies and establishes radio contact with the responding vehicles. Using the Medical Emergency Radio System (MERS) voice links, the PSAP provides information to the emergency response vehicle enroute to the incident. Calspan has also made arrangements to get information from the central dispatcher to their ACN operational test control center so that they can dispatch their instrumented accident investigation vehicle.

The operational test to be conducted in Erie County, New York will involve approximately 1000 privately-owned automobiles. Additional communications, special processing and display hardware will be installed at PSAP locations within Erie County.

Key Features

0 Fully automated collision notification system employing in-vehicle signal processor
0 The system can be modified to communicate through the satellite network in regions with poor cellular coverage

References

[1] ACN program description provided by CALSPAN SRL CORPORATION
[2] ITS Projects, USDOT January 1996

CELLULAR APPLICATION TO ITS TRACKING AND LOCATION (CAPITAL) BELTWAY PROJECT

Highlights

- Location:

  Washington DC Metropolitan area

- Scope:

  The Washington DC Area Operational Test and Demonstration program was a complete end-to-end test, from the collection and processing of wide area surveillance data to the dissemination of traffic data to remote users and in-vehicle equipment. The sections of roadway covered were I-495 West, from Rt. 7 to I-66, from Rt. 7 to Rt. 123, and selected arterials. Total number of vehicles geolocated was in excess of 100,000. Seven Direction Finding System (DFS) units were installed in the operational test configuration.

Cost:

Total estimated cost of project was $7,229,418. No cost to the user

Technology:

Cellular geolocation using sensor-equipped Bell Atlantic towers

Status

The system has been removed from the cell sites and is currently in storage

Start Date:

August 1993

End Date:

December 1995

Contacts:

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Basic Description of Project

This ITS Operational Test made extensive use of the existing cellular infrastructure for both area-wide surveillance and communications. E-Systems, Raytheon equipment was co-located on Bell Atlantic mobile towers to detect cellular usage and geolocate phones on designated roadways.

Goals and Objectives

Specific evaluation goals included determining the accuracy of geolocation data; accuracy in completeness of traffic information; usefulness of passive statistical processing for measuring volume and incidents; criteria for selecting roadways that can be monitored by these techniques; system capabilities; costs for deployment; public acceptance; and usefulness of information dissemination to fleet vehicles.

Work Plan

The Operational Test had five phases:

I. Design
II. Acquisition and Installation
III. Engineering Checkout
IV. Operational Test
V. Evaluation

Technology

The Operational Test and Demonstration (OTD) program had three components:

0 Surveillance:

This component used direction-finding equipment co-located at multiple sites throughout the geographic area of coverage to determine the direction from which the call was coming. These results were used to locate the vehicle by triangulation and Time-Difference-of-Arrival (TDOA) techniques. The geolocation component is composed of the Transmission Alert System (TAS), the Direction Finding System (DFS), and the Geolocation Control System (GCS)

0 Traffic Information:

A receiver took the locations of vehicles and processed the information to produce a variety of traffic information. It determined the roadway location of the vehicle, the speed of the vehicle, and any unusual traffic flow.

0 Data Distribution:

The Data Distribution component is provided by the Remote Operator Computers and the Mobile Display Terminals. Together, they display traffic information graphically to local and remote users and allow mobile users to periodically receive traffic information. Telephone connections, both land-line and cellular, are used to deliver traffic information to operators at remote computers or in vehicles.

The Direction Finding System used an eight-element antenna to determine the direction of a cellular signal. The time reference for the system clocks was provided by a Global Positioning System (GPS) receiver at each unit. Mobile units were in-vehicle display terminals that can display traffic incident information from the system.

Performance/Results

Accuracy of geolocation: 115 Meters CEP 1 sigma.
Other features are:

0 No required additions or modifications to mobile cellular phone equipment
0 Technique is independent of signaling standard
0 Typical geolocation accuracies of approximately 100 meters
0 Typical performance is 1 geolocation per 1 to 2 seconds
0 Typical site configuration is an intercept antenna array, GPS antenna, and 60 inches of ERA Standard rack-mounted equipment

Key Features

The system made use of the cellular infrastructure and was of no cost to the user, but the project itself was cost-intensive. The system used proven technology consisting of mostly commercial off-the-shelf components. The modular design of the system allowed extra processors to be installed easily to increase performance. The system was designed to work in a suburban environment, and its performance is likely to vary with the terrain and coverage of the area. The system used Advanced Transportation Management Systems to monitor the traffic flow, and Mayday was a spin-off of these systems.

References

[1] Washington DC Area Operational Test & Demonstration Program System Design Document, E-Systems, Raytheon, Inc., 16 December 1993
[2] Rural ITS Project Summaries, JHK & Associates, Inc., April 16, 1996
[3] ITS Projects, US DOT, January 1996
[4] E-CAPS Geolocation System, Diversity Wireless Products, April 1995
[5] Fax sheet from Robert C. Ewald, Raytheon E-Systems, June 26,1996

COLORADO MAYDAY SYSTEM

Highlights

0 Location:
12,000 square mile area in central Colorado

0 Scope:
Phase II will involve 50 vehicles and phase Ill will consist of a trial with up to a total of 2000 vehicles

0 Cost:
$3,832,286 (estimated total project cost)

0 Technology:
In-vehicle TIDGET device which uses GPS for position location, and a cellular phone for two-way communication (Motorola and Nokia devices)

0 Status:
Phase I (Detailed System Design) completed; entering Phase II (Initial System Trial); Phase III (full operational test) scheduled August, 1996

0 Start Date:
October 1994

0 End Date:
December 1997

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Basic Description of Project

The Colorado Mayday system is a federally sponsored Intelligent Transportation System (ITS) project currently being conducted in the United States. Mayday is being funded and implemented through the joint efforts of various public and private interests. The Mayday project team comprises the following member agencies: ENTERPRISE Group, Colorado State Patrol, NAVSYS Corporation, Environmental Systems Research Institute, Incorporated (ESRI), Cellular Incorporated, and FHWA. Castle Rock Consultants (CRC) has been retained by the project team to conduct an independent evaluation of the Mayday system.

Goals and Objectives

0 Evaluation of system performance
0 Evaluation of cost and benefit; User acceptance
0 Determine how to create organizational infrastructure to coordinate the activities of the various agencies, both public and private, that need to cooperate in order to establish a viable Mayday network

Work Plan

The Colorado Mayday operational test plan involves three logical and sequential phases:

0 Phase **I** (Detailed System Design) - The detailed system design was completed, and both a prototype in-vehicle unit and work station were constructed and evaluated.
0 Phase II (Initial System Trial) & Phase III (Full Scale Operational Test)- The emphasis of these phases is to explore the potential benefits of deploying a Mayday system under an operational test scenario. A series of staged events involving the Colorado State Patrol (CSP) will evaluate the system's ability to reduce the emergency response to reach a standard motorist. Work will also be undertaken during this phase to identify the appropriate public/private partnership structure to operate the system on a commercial environment after the operational test is complete.

Description of Technology

Vehicle position is determined by a front-end GPS receiver known as TIDGET, developed by NAVSYS Corporation. The TIDGET location device is a low-cost sensor that is able to store a snapshot of raw data from any GPS satellites that are currently in sight of the unit's antenna. Instead of processing the GPS data at the vehicle, the TIDGET simply converts the GPS satellite signals into a digital data stream compatible with the in-vehicle communication system. The in-vehicle communications module primarily consists of a cellular data modem and a cellular telephone control interface.

The communication system will provide the real-time two-way communication capability required between the vehicle and the control center to support the Mayday functionality. The location data from the TIDGET device is presented to the dispatch center in graphical and text format along with the details on the user requesting assistance, details of the vehicle, and the type of assistance required.

Performance/Results

Phase I was aimed at finding out when and where the system does and does not work. The following table shows data supplied by NAVSYS.

	Total number of calls				
	Good Cellular Coverage	Marginal Cellular Coverage	Poor Cellular Coverage	Total	%
Valid position determined	*277*	*71*	*40*	*388*	*87*
Invalid/no position determined	*37*	*12*	*7*	*56*	*13*
Total calls	*314*	*83*	*47*	*444*	*100*

Phase I results show that the Mayday system is able to transmit an accurate vehicle position in locations with favorable cellular coverage. Within areas of marginal cellular coverage, approximate positioning is often achieved. Where no positioning can be calculated, the system defaults into voice mode.

Status

Based upon Phase I evaluation results, the decision to proceed with phases II and Ill was reached by FHWA. Phase II will have 15 Motorola and 35 Nokia cellular devices. In phase Ill, 2050 sensors will be tested with the Nokia cellular device.

Kev Features

0 Simplicity of the TIDGET sensor design makes it low-cost, robust, and less vulnerable to failure

0 By taking advantage of aiding data from digital maps, a navigation solution can be computed from the TIDGET data even when four satellites are not visible. This increases the reliability of the emergency service when operating in a city or in mountainous regions where the satellite signals might be blocked

0 In Phase Ill, volunteers are responsible for paying both the cell phones and the monthly regular charges

0 This Mayday system uses an existing cellular telephone network for real-time two-way communication, so it offers the most potential to piggyback Mayday technology onto the general motoring public's existing equipment

References

[1] Exploring The Potential Benefits of a Mayday System: Phase One Results, presented at ITS 1996 Annual Meeting, April 15-18

[2] ITS Projects, USDOT January 1996

[3] Mayday Operational test project Evaluation Plan, prepared by Castle Rock Consultants, February 1996

[4] TIDGET Mayday System for Motorists, Alison Brown and Randy Silva, NAVSYS Corporation, 1994, IEEE

MINNESOTA MAYDAY PLUS

Highlights

0 Location:

Rural Minnesota

0 Scope:

The geographic boundary of the test is essentially everything that falls within a 60-mile radius of Rochester.

0 Cost:

Total cost: $2,519,130

The State will provide $1,881,307 of the total cost and the remaining amount will wme from team partner contributions.

0 Technology:

GPS, crash sensors, cellular communication, information processing. Added emphasis on development of components to support fully-automated collision and severity notification by employing an array of crash detectors

0 Status:

A total of 57 "hits" on the Mayday Plus RFPP. An RFPP response evaluation team selected from among Core team members now has the task of evaluating three such complete proposals

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Basic Description of Project

Module One of the project emphasizes the development of components necessary to support a fully-automated collision severity reporting system. Information processing and on-screen displays developed in the Colorado Mayday project will be enhanced to handle this increase in information.

Module Two will develop and deploy the infrastructure needed to support this collision notification system in rural Minnesota. Participation of the Mayo Clinic and the Minnesota State Patrol will provide insight into the institutional issues associated with public and private dispatch centers exchanging information.

Goals and Objectives

0 To help resolve institutional issues concerning the information exchange between public and private emergency service providers
0 To evaluate technical enhancements required to fully automate collision and severity notification at an acceptable cost
0 To assess the commercial viability of motorists' emergency call (both manual and automatic) services using automatic vehicle location and communications technologies
0 To promote national/international standards for information exchange relating to advanced emergency call systems

Status

An active core project team has been formed. A technical approach to the project has been drafted, and core team members have identified Mayday Plus functional requirements. An evaluation document has been drafted and Castle Rock Consultants has been serving as the independent evaluator. The potential for expansion into other Mn/DOT Districts/ITS projects (ARTIC, Orion, as well as into Southwestern Wisconsin and Northern Iowa) is being investigated. An RFPP that includes a project overview, technical approach, functional requirements and evaluation strategy has been issued.

Key Features

This system has been proposed for a rural type environment. A hybrid technology using GPS, crash sensors, cellular communication, and information processing has been proposed. The progress of the project, the sensitivities, and the lessons learned from its implementation can have great relevance to the I-95 Corridor itself. The project is in its early stages, and a clearer picture of the direction it will likely take will be available after an RFPP is finalized.

References

[1] Mayday Plus Fact sheet

[2] Rural ITS Project Summaries, JHK & Associates, Inc., April 16, 1996

[3] ITS Projects, US DOT, January 1996

NORTHROP GRUMMAN IDEA PROJECT

Highlights

0 Product Type:

Emergency Mayday system as applicable to vehicle collisions, medical emergencies, mechanical breakdown, and personal safety

0 Coverage:

National coverage (urban and rural)

0 Availability:

System in development for DOT

0 Cost:

$99,514 + $20,000 Cost sharing. Objective is to develop a low-unit-cost, low-infrastructure Mayday system

0 Technology:

GPS-based vehicle locating method, combination of cellular telephone network and a groundwave transmitter for the communication link, and a portable Radio Direction Finding (RDF) unit proposed

0 Status:

Started June 1, 1996. System in development for U.S. DOT- Traspottation Research Board

0 Contact:

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Northrop Grumman Electronics & Systems Integration Division
phone: (847) 259-9600
Keith Gates, IDEA Program, phone: (202) 334-1413

Basic Description of Project

This project will develop the initial architecture for a vehicle Mayday system that will provide nationwide coverage in both urban and rural locations and work in heavy foliage, ravines, canyons, poor weather, and all crash geometries. This Mayday system will take advantage of GPS and cellular telephone infrastructures, if the vehicle is equipped, but will function adequately without either. The Mayday system will integrate multiple communication methods using the key advantages of each to provide a robust system that works in all environments.

Goals and Objectives

This project will focus on satisfying the challenge of the rural scenario with both very low unit cost and low infrastructure cost. This project will define a system architecture for Mayday devices, including any key operational characteristics that may be necessary to field an effective system. The IDEA project will develop a system architecture that includes key attributes from several communication technologies and specifically addresses the rural scenario while minimizing the necessary additional infrastructure.

Work Plan

The IDEA Project will be completed in two stages. Stage 1 will consist of selecting a frequency band that supports the groundwave propagation concept for the Mayday system, defining potential antennas and mounting locations on the vehicle, and development of the initial high level system architecture. Stage 2 of the project will choose an antenna type, further define antenna locations on the vehicle, provide detailed high-level system architecture definition, and proof of concept field testing.

Description of Technology

The Mayday system and infrastructure will consist of three units: an in-vehicle unit, a regional base receiver, and a portable Radio Direction Finding unit. The primary function of the in-vehicle unit is to process internal or external stimuli and send a Mayday message over the communications link. The in-vehicle unit will take advantage of the cellular telephone system for the communications link if a phone is installed and cellular coverage is available.

In the rural environment, or when cellular coverage is not available, the system would sequence to a Mayday communications link. The message would be received by the base receiver unit where it would be decoded to provide vehicle identification and indicate the location, time, and type of emergency. The base receiver unit is envisioned to be installed at county sheriff offices and state police posts throughout the nation. A portable RDF unit would be available for emergency personnel to aid in locating the exact scene of the emergency.

The In-vehicle Unit

The Mayday unit would be capable of receiving a variety of stimulus input from the host vehicle including air-bag sensors for crash detection, GPS receivers for position information, and a control panel for manual activation. A cellular telephone interface would be available to provide the communication link in urban areas, and a groundwave transmitter would provide the communication link in rural areas or when the cellular telephone network is not accessible.

The Communication Link

The cellular telephone network can serve as the communication link in urban areas, and a groundwave transmitter would provide a robust communication link in rural areas where cellular coverage is not accessible.

Status

The Mayday system is under development for the Department of Transportation and while the concept has been completed, the company is waiting for an opportunity to identify a customer. Until then, a decision has been made not to put any more money into the product development. There has been no application of the product to date. Project started June 1, 1996.

Key Features

The IDEA project will develop a Mayday system architecture and communication method capable of providing complete nationwide emergency coverage. Northrop Grumman intends to develop prototype units based on the results of this IDEA project with focus on harsh terrain and rural areas where GPS/cellular has failed in the past. This will then lead to a low unit cost, low infrastructure, nationwide vehicle Mayday system.

References
[1] Northrop Grumman Fax sheet

PUGET SOUND HELP ME (PUSHME) MAYDAY SYSTEM

Highlights

- Location:
  Washington State (Northwest region)
- Scope:
  Usability, marketability, technological and institutional evaluation. Seven month test period
- Cost:
  $2,500,000 (estimated total project cost), private sector contribution 18 percent
- Technology:
  Two Differential GPS-equipped Mayday technologies, Analog Cellular System (Motorola), and two-way pager system using Cellular Digital Packet Data (CDPD) provided by XY Point
- Status:
  Full field operational test simulating and evaluating Mayday calls was completed in May, 1996
- Start Date:
  November 1994
- End Date:
  Completed May 1996
- Contacts:

Morgan Balogh	Bart Cima
Washington State DOT	David Evans & Associates
phone: (206) 543-0078	phone: (206) 4553571
fax: (206) 685-0767	fax: (206) 455-3061

Basic Description of Project

The PuSHME project team consisted of a consortium of three public agencies, five private corporations, and an academic institution. The Federal Highway Administration (FHWA), the Washington State Department of Transportation, and the Washington State Patrol sponsored the project, provided support, and approved the various work elements. David Evans and Associates (DEA), assisted by the IBI group, worked on the project implementation, integration, administration, and management. The laboratory of Leasability Testing and Evaluation at the University of Washington focused on the requirements of response center personal. Response System Partners, Inc. (RSPI) and XYPoint were the technology providers and provided emergency notification devices and customer response center systems. RSPI provided equipment through its vendor, Motorola. The University of Washington participated in the PuSHME project as the independent evaluator.

Goals and Objectives

0 Evaluate performance of emergency and assistance communications system
0 Evaluate system usability
0 Evaluate system marketability
0 Evaluate institutional issues

Operational Test Plan

The PuSHME field operational test included three types of tests:

0 The Partial Field Operational Test, which included roughly 200 volunteers using the devices daily to provide a measure of how quickly and reliably the system could accept, recognize, and prioritize a call.
0 The Specific Tests, which analyzed the specific function of the devices. They included the dropped carrier, moving, topographic interference, location specific, and nationwide tests.
0 The Full Field Operational Test, which simulated and evaluated mayday calls from start to finish, including the dispatch of emergency services.

Description of Technology

The PuSHME project evaluated two GPS-equipped Mayday technologies: a Motorola system employing an analog cellular phone, and a XYPoint system utilizing a two-way pager operating on the Cellular Digital Packet Data (CDPD) protocol network. The basic function of the two devices is similar. A user sends an emergency call to a Central Service Center (CSC) by pressing a button on the device. The CSC receives and processes the call and sends location, incident, and subscriber information to the appropriate emergency service. In obtaining and refining information, the Motorola device has a cellular phone link, while the XYPoint device has a display screen that the CSC can use to ask the users questions. The user responds using the device's "Yes" and "No" keys.

Performance/Results

0 Preliminary results show that the cellular phone technology was highly useful. The two-way pager technology necessitated a series of questions to refine the location and relate the problem.
0 Differential correction of GPS data and adequate mapping were also very important. For both the participating technologies, the mapping data base was inconsistent in its accuracy.

Status

The evaluation team is preparing the evaluation report due late 1996.

Key Features

0 As the operational test of this project is complete, the evaluations will be of great importance to future Mayday initiatives
0 The comparative advantage and the tradeoffs between voice and data can be illustrated

References

[1]PUSHME Institutional Issues Report, David Evans & Associates, 7 June 1996 Version
[2] PUSHME Controlled Field Testing Report, David Evans & Associates, 18 June 1996 Version
[3] ITS Projects, USDOT January 1996

SAN DIEGO SMART CALL BOX

Highlights

- Location:
  San Diego, California
- Scope:
  Determination of the operational effectiveness and the operational suitability of the Smart Call Box system in a real-world transportation environment, and determination of results that can support the ITS program.
- Cost:
  $2,260,000
- Technology:
  Cellular call boxes
- Status:
  Completed
- Start Date: September 1995
- End Date: June 30,1996
- Contact: Jim Dodd
  Vice President, TeleTran Tek Services
  phone: (619) 279-1299
  fax: (619) 279-8424
  e-mail: jimdodd@aol.com

Basic Description of Project

The Federal Highway Administration (FHWA) and the California Department of Transportation (Caltrans) funded an operational test in the San Diego, California region to test the feasibility of call boxes as surrogate intelligent vehicle-highway system roadside controllers. The test was divided into five subtests and organized into three phases. The first phase, Subphase One, tests census and hazardous weather detection and reporting functions. Subphase Two comprises the Incident Detection test, while Subphase Three comprises the Changeable Message Sign Control Test and the Closed Circuit Television Surveillance, Verification, and Control Test.

Results from San Diego SMART Call Box are expected to relate to the national Intelligent Transportation System program by demonstrating that an intelligent roadside infrastructure can host multiple ITS functions, thus reducing deployment costs in ITS architecture using beacons or other forms of roadside controllers.

Goals

1. Evaluate the cost-effectiveness of smart call boxes for:
0 Transmission of traffic census data
0 Transmission of adverse weather alarms
0 Incident detection and transmission of incident alarms
0 Transmission of control signals for variable message signs
0 Transmission of video and control signals for closed circuit video systems
2. Document and discuss institutional issues encountered in the Field Operational test.

Description of Technoloav

The call box system consists of five major elements:

1. A technologically advanced call box
2. The cellular telephone network
3. The public switched telephone network
4. The call box maintenance system
5. The call box answer center
6. Call Box from two vendors, GTE and U.S. Commlink, were used in the test

Status

As of June 1996, the San Diego SMART Call Box Field Operational Test was completed. A draft evaluation report (Subtest Report) has been submitted on July 3, 1996

Key Features

0 Accessibility to public
0 Integration with other ITS projects such as ATMS and traffic surveillance

References

[1] Early Results Report: San Diego Smart Call Box Field Operational Test, January 31, 1996

[2] GTE Cellular Call Box Systems Brochure

[3] Fax Transmittal

TRANSCAL EMERGENCY NOTIFICATION SYSTEM (ENS)

Hiahliahts

0 Location:
Operational test in the San Francisco/Sacramento/Tahoe/Reno areas and the I-80 corridor connecting these areas

0 Scope:
Determine the utility and technical feasibility of a satellite-based emergency location system for distressed vehicles in mountainous regions where traditional radio/telephone communications are blocked or degraded

0 Cost:
$7,155,000 (estimated total project cost)

0 Technology:
Low Earth Orbit (LEO) satellite-based position location and communication system

0 Start Date:
Late 1996

0 End Date:
Not available

0 Contact:
Clifford Loveland
California Department of Transportation
New Technology and Research Program (MS-83)
PO Box 942873
Sacramento, CA 94273-0001
phone: (916) 654-9970
fax: (916) 654-9977

Goals and Objectives

The Field Operational test is intended to:

0 Determine the accuracy of the vehicle’s position as determined by the LEO satellite

0 Determine the reliability of sending and receiving emergency notification messages, especially in the mountainous terrain around Lake Tahoe

0 Measure the time delays from the initiation of an emergency message to when a confirmation message is received by the vehicle in distress
0 Determine if there are conflicts or position ambiguities when more than one vehicle is in distress and transmitting an emergency message

Work Plan

The Transcal ENS task planned to use the ORBCOMM satellite constellation for the field operational test. However, due to slow emergence of a demand for the LEO communication services and problems experienced in finding space in available launch vehicles, only two LEO satellites are presently in polar orbit. This necessitated the alternative approach to effectively make use of what is available by conducting some early testing with a limited satellite set in late 1996 and early 1997. The full-scale testing with the 36-satellite constellation is scheduled in late 1997.

Description of Technology

ORBCOMM is a low Earth-orbiting (LEO) satellite data communications network, developed by Orbital Communications Corporation. The ORBCOMM network boasts a low-cost (not given) position determination and two-way communications services with 100% geographic coverage. Due to a lack of complete Mayday system aspect coverage, OBRCOMM has taken a systems approach to developing a Mayday service which includes partnering with participants who have the appropriate expertise.

The initial network consists of 2 LEO satellites, and a final number of 36 are planned to be in orbit by late 1997. ORBCOMM can determine the location of the distressed vehicle in one of two ways. For high grade position determination of less than 30 meters, an integral GPS receiver and ORBCOMM transceiver can be used. For location accuracies of less than 300 meters, ORBCOMM has a built-in position determination capability using a Doppler shift measurement technique and the ORBCOMM satellite network. The lowest cost will be the built-in ORBCOMM position location service (price not specified). The ORBCOMM operates on VHF frequencies, which allows the equipment to be manufactured at prices comparable to simple hand-held mobile radios. It will be possible to share the AM/FM antenna in the vehicle.

In the ENS system, the LEO satellites use triangulation to estimate the position of the vehicle that transmitted a distress message to the satellite network and relay that position estimate to the ground station along with the distress message. When the driver pushes a button on the dashboard or the airbag is deployed, a short coded message with the vehicle's identification, time of day, and date would be sent to the LEO constellation of satellites. Each satellite that received the message would relay the message and the time of receipt of the message.

The ground station would use a time difference of arrival (TDOA) technique to estimate the location of the origin of the message and send the information to the Inter-Regional Traveler Information System (IRTIS). The IRTIS computer would receive the call, decode the message, and plot the location of the vehicle. At this point, the IRTIS operator would probably call 911 and notify them of the emergency, when it happened, and what kind of assistance was needed. When the IRTIS operator received a confirmation that help was dispatched and an estimate of how long it would be before the help arrived on the scene, the IRTIS operator would send the estimated time of arrival for help back to the satellite ground control station using the same dial-up modem land line. The ground station would broadcast the message to the LEO satellites for re-transmission to the vehicle in distress, where the estimated time of arrival (ETA) of help is displayed on the front panel.

Status

The Transcal ENS task planned to use the ORBCOMM satellite constellation for the field operational test. However, due to slow emergence of a demand for the LEO communication services and problems experienced in finding space in available launch vehicles, only two LEO satellites are presently in polar orbit. This led to an alternative approach to effectively make use of what is available by conducting some early testing with a limited satellite set in late 1996 and early 1997. The full-scale testing with the 36-satellite constellation is scheduled in late 1997.

Key Features

- Claim of 100% geographic coverage
- Planned use in TransCal ENS operational test
- The Transcal system will be the first to make use of the new Low Earth Orbit (LEO) Satellite systems and should provide almost total coverage over the United States. The performance in harsh terrains is still untested, however.

References

[1] ORBCOMM: A Systems Approach to a Ubiquitous Mayday Communications System, Donald L. Thoma

[2] Fax Transmission from California DOT, June 20, 1996

[3] ITS Projects, USDOT January 1996

PRIVATE MAYDAY PROGRAMS AND TECHNOLOGIES

Emergency Response Network By Rockwell/ADT
Enhanced Cellular Services By TRUEPOSITION
FONEFINDER By Tendler Cellular
OMNITRACS By Qualcomm
ONSTAR By GM
QUIKTRAK By Comtrak
RESCU System By FORD

EMERGENCY RESPONSE NETWORK BY ROCKWELL/ADT

Highlights

- Location:
  None specified
- Scope:
  Initially proposed to be made available through ADT-authorized dealers in all major metropolitan areas, covering about 7,700 cities and towns in the U.S.
- Cost:
  Not Available
- Technology:
  GPS for location; messages transmitted over a data link network
- Status:
  Currently on hold and no further information available
- Start Date:
  Not Available
- End Date:
  Not Available
- Contact:

Richard H. Pacini	Ralph L. Frank
Rockwell Automotive	ADT Security Systems
phone: (810) 435-1752	phone: (201) 316-1228

Basic Description of Product

The product proposes a device that allows motorists to summon emergency personnel to their location at the touch of a button. A motorist in distress activates the response network by pushing one of three buttons featuring easy-to-understand icons. The icons represent police, ambulance or roadside assistance. The system instantly transmits a data message containing GPS coordinates, the nature of the emergency, and vehicle location to an ADT Customer Monitoring Center (CMC). The message travels from the vehicle to the CMC, where ADT monitoring professionals can notify the appropriate emergency or roadside assistance agencies. A moving vehicle's location can be transmitted every 20 seconds. An optional pocket-sized keyring activator can allow motorists to activate the system up to 100 feet away from their vehicle. The proposed system was to utilize the same GPS satellites that Rockwell developed for the department of Defense.

Status

Project currently on hold.

Key Features

A private venture requiring fewer institutional arrangements than other more complex public systems. The project is on hold now and will most likely not be in a position to be available for the I-95 Corridor any time soon.

References

[1] ADT Security Systems, Rockwell Automotive marketing information

ENHANCED CELLULAR SERVICES BY TRUEPOSITION

Highlights

0 Location:
National availability

0 Scope:
An automatic location system for wireless subscribers

0 Cost:
None specified

0 Technology:
Cellular

0 Status:
Will be tested in New Jersey beginning in the fall

0 Contact: Louis A. Stilp
The Associated Group, Inc.
phone: (610) 660-4910
fax: (610) 660-4920
e-mail: lstilp@grp.com

Basic Description of Product

TruePosition Cellular Location System is a passive overlay system that complements existing cellular and Personal Communication Service (PCS) network architectures. TruePosition enables wireless carriers to determine the location of any cellular or PCS telephone with a planned accuracy of 500 feet or less. TruePosition's location data and statistics are forwarded in real time for use in a variety of applications and revenue services.

Description of Technology

TruePosition is based on patented Time Difference of Arrival (TDOA) location technology. It is comprised of four major subsystems:

1. **Signal Collection System (SCS):** A receiver designed for location applications. It is typically located at "coverage" cell sites or other sites that provide good signal visibility. The SCS

receives the reverse control channel transmissions occurring on all wireless phones using wideband digital receivers.

2. **TDOA Location Processor (TLP):** A digital signal processing array designed for high volume location processing. The TLP contains algorithms necessary for computing position, confidence, interval, speed, and direction of travel.
3. **Applications Processor (AP):** A database software system that controls the TruePosition network and provides carrier and subscriber access to the location database records. One or more AP's may be located anywhere within a carrier's network, and then remotely connected to the TLP. The AP provides network management, configuration, and control of the TruePosition system, including remote software download to all components.
4. **User Display System:** A variety of user terminals and workstations can be supported by TruePosition.

Status

The Associated Group, Inc. and Comcast Cellular Communications, Inc. will launch a trial this fall in New Jersey of the TruePosition Cellular Location System. The service trial will span a 50-mile stretch of the New Jersey Turnpike, including Burlington, Camden, Gloucester, and Salem counties.

Key Features

0 TDOA location technology
0 One of the few cellular-based location technologies that is available
0 Planned use on New Jersey Turnpike test

References

[1]TruePosition Brochure, Associated Group, Inc.

FONEFINDER BY TENDLER CELLULAR

Highlights

◊ **Location:**

National

0 Scope:

Tendler has developed a chip that, through the global positioning system's network of satellites, can assist emergency workers.

0 Cost:

FoneFinder system: $0-$100

911 Back-up system: $30.00 per call or $36.00 per year

0 Technology:

GPS

0 Status:

Prototype in Audiovox's model 405 cellular phone

0 Start Date: Not Available

0 End Date: Not Available

0 Contact:

Robert K. Tendler
Tendler Cellular
phone: (617) 566-6953
fax: (617) 723-7186

Basic Description of Product

Tendler Technologies has developed and patented a GPS-based chip for reporting to dispatch centers the location of an individual in distress through telling the dispatcher in English the location of the caller. This is done through voice synthesis in which the FoneFinder tells the dispatcher the location of the phone that is calling 911. The system requires no infrastructure, either at a cell site or at the dispatch center. FoneFinder claims no infrastructure cost, no changes to cellular phone switches, and no cost to the dispatcher, as the location of the individual is broadcast verbally.

Description of Technology

FoneFinder phones are provided with an internal GPS engine and the FoneFinder voice chip set which is utilized to tell the EMS dispatcher the location of the individual, the cellular telephone number, the identity of the individual, and other relative information. Because the transmission is in English and uses the normal audio channel, cell sites do not need to be adapted to any particular digital format.

Status

Tendler's device is working as a prototype in Audiovox's model 405 cellular phone. Tendler claims to have orders for test units from several cellular carriers, including Bell Atlantic, Nynex Mobile Inc., AT&T Wireless Services Inc., GTE Corp., and Comcast Corp. The product is scheduled to be available by the fall of 1996.

Key Features

0 GPS-based chip
0 Synthesized voice message

References

[I] Wireless Week: Wireless Locator Soon a Reality, Charles Mason, May 20, 1996
[2] Introducing FoneFinder: A Solution Today to the Personal Safety Crisis, Tendler Cellular

OMNITRACS BY QUALCOMM

Hiahliahts

- 0 Location:
  Offered by Qualcomm, Inc., OmniTRACS
- 0 Scope:
  Capable of providing national coverage
- 0 cost:
  $80 - $120 per month for 2 or 3 messages/day
- 0 Technology:
  OmniTRACS is a satellite system comprised of three major components or subsystems: mobile communications hardware, network management service, and system software
- 0 Status:
  Installed on 160,000 trucks
- 0 Contact:
  Qualcomm, Inc., OmniTRACS Division, 6455 Lusk Blvd., San Diego, CA 92121-2779, USA
  phone: (800) 34-TRACS
  fax: (619) 658-5288

Basic Description of Product

The OmniTRACS system is an integrated communications tool that can link vehicles in the fleet to the dispatch center. Messages and positioning information are sent via satellite through the Network Management Center (NMC) to dispatch centers throughout the United States. Onboard hardware includes a keyboard display, a communications unit, and a continuous tracking antenna in a sealed dome. Vehicle location information is provided hourly and in each message as part of the base service. It is also available on demand. A Ku-band antenna with an electronicallydriven motor keeps the antenna aligned with the satellite at all times. The driver display and Enhanced Display Unit (EDU) are also available.

Description of Technology

The heart of the two-way communications unit is a microprocessor-based system that utilizes QUALCOMM'S Code Division Multiple Access (CDMA) technology. The Ku-band antenna permits error-free transmission and good reliability. It is electronically driven in order to keep it aligned with the satellite at all times. To ensure operational redundancy, duplicate computer systems with a backup generator are maintained in San Diego. A second fully-equipped backup hub located in Las Vegas further safeguards operational continuity. The 15-line EDU is an option to the standard 4-line keyboard display unit, and is plug-compatible as a replacement for existing 4-line units.

Performance/Results

2000 ft position location accuracy (capable of adding GPS for better accuracy). Large antenna required.

Status

Installed on 160,000 trucks nationwide

References

[I] "OmniTRACS, The Complete Satellite System" brochure from QUALCOMM

ONSTAR BY GM

Highlights

0 Location:
National

0 Scope:
National coverage

0 Cost:
$895 installation cost. Monthly service fee $22.50 (includes many other services)

0 Technology:
GPS & Cellular

0 Status:
Optional feature in 1997 Cadillacs

0 Start Date: 1997

0 End Date: Unknown

0 Contact:

Julie Hamp	Bruce MacDonald
Cadillac Motor Car Division	OnStar
phone: (810) 492-4347	phone: (810) 6964714

Basic Description of Product

OnStar is built around three components: a GPS receiver, a hands-free cellular phone, and the OnStar Center. OnStar integrates on-board vehicle electronic architecture with GPS satellite technology and a cellular phone. These technologies link the driver and the vehicle with the OnStar Center, where advisors will provide person-to-person assistance using databases to offer personalized information and service.

Status

GM will first install the system as an option on all 1997 front-drive Cadillacs.

Kev Features

0 Voice-activated cellular phone
0 GPS location technology

- ◊ Theft detection
- ◊ Automatic notification of airbag deployment
- ◊ Private venture
- ◊ Roadside assistance with location
- ◊ Emergency services button
- ◊ Remote door unlock
- ◊ Routing assistance/navigation
- ◊ Convenient service

References

[1] OnStar Media Information Package, OnStar

QUIKTRAK BY COMTRAK

Highlights

0 Location:

Offered by Comtrak, 201 Evans Lane, St. Louis, Missouri 63121-1126, USA

0 Scope:

Stolen vehicle recovery, personal safety, emergency roadside assistance, vehicle location and management system

0 Coverage:

A typical Quiktrak installation may service an area of up to 10,000 km^2 depending upon the nature of the topography. In order to cover a much wider area, Quiktrak cells, each servicing an area of up to 10,000 km^2, may be linked together. Quiktrak is a multi-user system wherein a base system can support up to 50 simultaneously logged-on users each with their own Track Display Station (TDS). The system allows up to a quarter of a billion individual coded transponders to be deployed.

0 Cost:

Not Available

0 Technology:

Vehicle management system providing vehicle location, tracking, and two-way communications using a network of radio transmitters and receivers. Time of Arrival measurements of the signal used for location determination.

0 Status:

Quiktrak is operational in Mexico City and Sydney, and a national telephone company installed Quiktrak in their fleet of service vehicles.

0 Contact:

Tom F. Bush
Business Development Manager
phone: (314) 553-4373
fax: (314) 5534279
e-mail: comtrak@inlink.com

Basic Description of Product

Quiktrak is a multi-task vehicle management and communications system providing non-stop visibility of any Quiktrak equipped vehicle. Operating over a network of radio transmitters and receivers, Quiktrak pinpoints vehicle location. It also provides instantaneous text messaging to and from each vehicle. It also has the capability of reporting unauthorized vehicle entry, initiating vehicle tracking, and alerting the Quiktrak security bureau to the vehicle's location. With the push of a button, police, medical, or roadside assistance can be summoned. A back-up power source is provided as a fail-safe measure in the event of failure of the primary battery.

Description of Technology

Quiktrak utilizes spread-spectrum radio-beacon technology, and uses a covert mobile unit hidden or disguised in or about a vehicle. The radio-beacon location methods are based on measurements of time-of-arrival of signals at the receiver. Quiktrak systems were developed using a radio frequency bandwidth designed to optimize performance over coverage areas comprising a typical mix of central business districts, urban, suburban, and rural regions.

Performance/Results

- ◊ One of the most publicized success stories occurred in Sydney while tracking down a serial murderer wanted by the Australian authorities in 1991.
- ◊ In Mexico City, a large department store has reported a reduction in delivery truck hijackings from approximately one per week to zero successful attempts over a five-month period. The same company reports a fleet productivity increase of 53% since Quiktrak was installed.
- ◊ A national telephone company installed Quiktrak in their fleet of service vehicles and significantly reduced the response time of their customer service teams.

Radio noise and interference limit the performance of radio-beacon systems. Quiktrak systems are capable of accurately measuring the arrival times of the first detectable signals and ordinarily achieve location accuracies of around 30m. Spread-spectrum beacon systems such as Quiktrak combine low in-vehicle cost with moderate infrastructure costs.

Status

Quiktrak has found success in its applications in Sydney and Mexico City. It is available as an off-the-shelf product.

Key Features

Quiktrak, though moderately priced, would require the installation of radio transmitters and receivers throughout the coverage region. Its performance would be limited by radio noise and interference typical of radio-beacon systems. This system is very infrastructure-intensive.

References

[1] Quiktrak brochure
[2] Reference: 94102-V3 January 1995, British Aerospace Australia Limited (BAeA)

RESCU SYSTEM BY FORD

Highlights

0 Location:
National

0 Scope:
National coverage

0 Cost:
Initial cost $1,995 - no monthly fee for 4 year agreement

0 Technology:
GPS & Cellular

0 Status:
Available option in 1996 Lincoln Continentals

0 Start Date:
First quarter of 1996

0 End Date:
Not specified

0 Contact: Don Duncan
Ford Motor Co.
phone: (313) 845-1582

Basic Description of Project

The Remote Emergency Satellite Cellular Unit (RESCU) option is being introduced on the 1996 Lincoln Continental in the first quarter of the 1996 calendar year. The system combines cellular and global positioning satellite (GPS) technology to give the consumer emergency or roadside assistance service. Also available is a voice-activated phone.

Description of Technology

0 By pushing one of two buttons in the Continental's overhead console, a cellular call is made to the Westinghouse Emergency Response Center in Irving, Texas. The two buttons are a truck icon for roadside assistance and an ambulance icon for emergency assistance. A password established by the motorist is used to confirm if a button was pushed in error. No password or

an incorrect password causes police assistance to be dispatched to the location. Each activation is started by sending a data signal over the cellular phone.

Included in signal:
- ◊ Type of alarm (emergency/roadside)
- ◊ Vehicle ID number
- ◊ Latitude and longitude via GPS system
- ◊ Dilution of precision
- ◊ Last recorded speed and direction of the vehicle
- ◊ Time tag identifying when last position was taken
- ◊ Call-back phone number

The Westinghouse Security System currently handles an average of 25,000 residential and business security alarm signals per day, with alarm verification response initiated within 20 seconds on average. Lincoln RESCU customers will be entitled to unlimited responses during the vehicle's four-year warranty.

Field Test

The field tests were performed in eight cities: Baltimore, Chicago, New York, Dearborn, Blacksburg, Dallas, Flagstaff, and San Francisco. In these tests, a call was placed, and off-duty police officers were used to track down the vehicles without the benefit of voice contact. The cars were located for 96% of the activations within less than 11 minutes from the activation.

The 4% failures were attributed to:
- 0 Understaffing of operators during the test
- 0 Lack of cellular coverage in the area
- 0 New subdivisions that were not yet covered on the digital map database

Status

The Ford RESCU system was made available for the 1996 Lincoln Continentals. Reports of 25,000 orders being made were rumored. Well above expected volume.

Key Features

0 Maintain direct voice contact with the motorist
0 Stay in phone contact with the motorist until emergency help arrives
0 Notify pre-designated family contacts or friends in case of an emergency
0 Provide the Lincoln Continental's roadside assistance and call-back confirmation of problem resolution.

References

[I] Ford RESCU Presentation Paper, Don Duncan

FCC RULING

FCC gave a final ruling for the implementation of E911 on July 26, 1996. Some excerpts from the FCC ruling adopted at the end of July are given below:

Not later than 12 months after the effective date of the rules adopted in this FCC proceeding, covered carriers must process and transmit to any appropriate PSAPs all 911 calls made from wireless mobile handsets which transmit a code identification, including calls initiated by roamers. The processing and transmission of such calls shall not be subject to any user validation or similar procedure that otherwise may be invoked by the covered carrier.

In the case of 911 calls made from wireless mobile handsets that do not transmit a code identification, not later than 12 months after the effective date of the rules adopted in the proceeding, covered carriers must process and transmit such calls to any appropriate PSAP which previously has issued a formal instruction to the carrier involved that the PSAP desires to receive such calls from the carrier.

Not later than 12 months after the effective date of the rules adopted in the proceeding, covered carriers must be capable of transmitting calls by individuals with speech or hearing disabilities through devices used in conjunction with or as a substitute for traditional wireless mobile handsets, e.g., through the use of Text Telephone Devices (TTY), to local 911 services.

The implementation and deployment of enhanced 911 features and functions will be accomplished in two phases. Under Phase I, not later than 12 months after the effective date of the rules adopted in this proceeding, covered carriers must have initiated the actions necessary to enable them to relay a caller's Automatic Number Identification (ANI) and the location of the base station or cell site receiving a 911 call to the designated PSAP. Not later than 18 months after the effective date of the rules adopted in the Order, such carriers must have completed these actions. These capabilities will allow the PSAP attendant to call back if the 911 call is disconnected.

Under Phase II, not later than five years after the effective date of the rules adopted in this proceeding, covered carriers are required to achieve the capability to identify the latitude and

Summary of Mayday Initiatives

longitude of a mobile unit making a 911 call, within a radius of no more than 125 meters in 67 percent of all cases.

The E911 (Phase I and Phase II) requirements imposed upon covered carriers by these actions in this Order shall apply only if (1) a carrier receives a request for such E911 services from the administrator of a PSAP that is capable of receiving and utilizing the data elements associated with the services; and (2) a mechanism for the recovery of costs relating to the provision of such services is in place. If the carrier receives a request less than 6 months before the implementation dates of Phase I and Phase II, then it must comply with the Phase I and Phase II requirements within 6 months after the receipt of the notice specifying the request.

Covered carriers, in coordination with the public safety organizations, are directed to resolve certain E911 implementation issues, including grade of service and interface standards, through industry consensus in conjunction with standard-setting bodies. This Commission intends to remain actively involved, as appropriate, to ensure resolution of issues necessary to prompt widespread availability of E911 service.

The FCC seeks comment on possible approaches to avoid customer confusion that could be generated by a system under which customers in the same geographic area may or may not be able to complete non-code identification 911 calls depending upon the practices of the various PSAPs serving that area. Specifically, it request comments regarding whether, within a reasonable time after the one-year period, PSAPs should no longer have the option to refuse to accept non-code identification 911 calls. Thus, covered carriers would be obligated to transmit all 911 calls to PSAPs.

The FCC also seeks comment on a range of related issues, including the following: (1) Should covered carriers provide PSAPs with information that locates a wireless 911 caller within a radius of 40 feet, using longitude, latitude, and altitude data, and that provides this degree of accuracy for 90 percent of the 911 calls processed? (2) Should wireless service providers be required to supply location information to the PSAP regarding a 911 caller within a certain number of seconds after the 911 call is made? (3) Should wireless service providers be required to update this location information throughout the duration of the call? (4) What steps could be taken to enable 911 calls to be completed or serviced by mobile radio systems regardless of the availability (in the geographic area in which a mobile user

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seeks to place a 911 call) of the system or technology utilized by the user's wireless service?

References

http://www/fcc.gov/Bureaus/Wireless/Orders/fcc96264.txt